

PRELIMINARY AMENDMENT  
PCT/FR03/00088, filed: January 13, 2003

**AMENDMENTS TO THE CLAIMS:**

**This listing of claims will replace all prior versions and listings of claims in the application:**

**LISTING OF CLAIMS:**

1. (original): Process for manufacturing a steel product made of copper-rich carbon steel, wherein:

- a liquid steel is produced, which has the following composition, expressed as percentages by weight:

\*  $0,0005\% \leq C \leq 1\%$   
\*  $0.5 \leq Cu \leq 10\%$   
\*  $0 \leq Mn \leq 2\%$   
\*  $0 \leq Si \leq 5\%$   
\*  $0 \leq Ti \leq 0.5\%$   
\*  $0 \leq Nb \leq 0.5\%$   
\*  $0 \leq Ni \leq 5\%$   
\*  $0 \leq Al \leq 2\%$

the remainder being iron and impurities resulting from production;

- this liquid steel is cast directly into the form of a thin strip having a thickness less than or equal to 10 mm;
- the strip is cooled rapidly to a temperature less than or equal to 1000°C;

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- the thin strip is subjected to hot-rolling at a reduction rate of at least 10%, the end-of-rolling temperature being such that, at this temperature, all the copper is still in a solid solution in the ferrite and/or austenite matrix;
- the strip is subjected to forced cooling so as to keep the copper in a supersaturated solid solution in the ferrite and/or austenite matrix;
- and the strip is coiled.

2. (original): Process according to claim 1, characterised in that the Mn/Si ratio is greater than or equal to 3.

3. (currently amended): Process according to ~~either claim 1 or 2~~claim 1, characterised in that the thin strip is cast on a casting installation between two internally cooled rolls rotating in opposite directions.

4. (currently amended): Process according to ~~any one of claims 1 to 3~~claim 1, characterised in that hot-rolling of the strip is carried out in line with the casting of the strip.

5. (currently amended): Process according to ~~any one of claims 1 to 4~~claim 1, characterised in that the rate V of forced cooling after hot-rolling is such that

$$V \geq e^{1.98(\%Cu)-0.08}$$

wherein V is expressed in °C/s and %Cu in % by weight.

6. (currently amended): Process according to ~~any one of claims 1 to 5~~claim 1, characterised in that the carbon content of the steel is between 0.1 and 1% and in that the strip is

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coiled at a temperature higher than the temperature  $M_S$  at the beginning of martensitic transformation.

7. (currently amended): Process according to ~~any one of claims 1 to 5~~claim 1, characterised in that the strip is coiled at less than 300°C and in that the strip is then subjected to a copper precipitation heat treatment at between 400 and 700°C.

8. (original): Process according to claim 7, characterised in that the carbon content of the steel is between 0.1 and 1% and in that the strip is subjected to precipitation heat treatment without being uncoiled beforehand.

9. (currently amended): Process according to ~~any one of claims 1 to 5~~claim 1, characterised in that coiling of the strip is carried out at a temperature which is both higher than the temperature  $M_S$  at which the martensitic transformation begins and lower than 300°C, and is followed by cold-rolling, recrystallisation annealing in a temperature range where the copper is in a supersaturated solid solution, forced cooling to keep the copper in a solid solution and precipitation tempering.

10. (original): Process according to claim 9, characterised in that said precipitation tempering is carried out at between 600 and 700°C in a continuous annealing installation.

11. (original): Process according to claim 9, characterised in that said precipitation tempering is carried out at between 400 and 700°C in a batch annealing installation.

12. (currently amended): Process according to ~~any one of claims 1 to 5~~claim 1, characterised in that coiling of the strip is carried out at a temperature which is both higher than

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the temperature  $M_S$  at which the martensitic transformation begins and lower than 300°C and is followed by cold-rolling and batch annealing at between 400 and 700°C which acts as both recrystallisation annealing and precipitation tempering.

13. (currently amended): Process according to ~~any one of claims 9 to 12~~claim 9, characterised in that the carbon content of the steel is between 0.1 and 1%.

14. (currently amended): Process according to ~~any one of claims 9 to 12~~claim 9, characterised in that the carbon content of the steel is between 0.01 and 0.2%.

15. (currently amended): Process according to ~~any one of claims 9 to 12~~claim 9, characterised in that the carbon content of the steel is between 0.0005% and 0.05% and in that its copper content is between 0.5 and 1.8%.

16. (original): Process according to claim 15, characterised in that, prior to precipitation hardening, the strip is cut to form a sheet which is shaped by drawing, and in that precipitation tempering is carried out on the drawn sheet.

17. (currently amended): Process according to ~~any one of claims 1 to 15~~claim 1, characterised in that the strip is subjected to a final treatment in a skin-pass rolling mill.

18. (currently amended): Steel product, characterised in that it is obtained by a process according to ~~any one of claims 1 to 17~~claim 1.